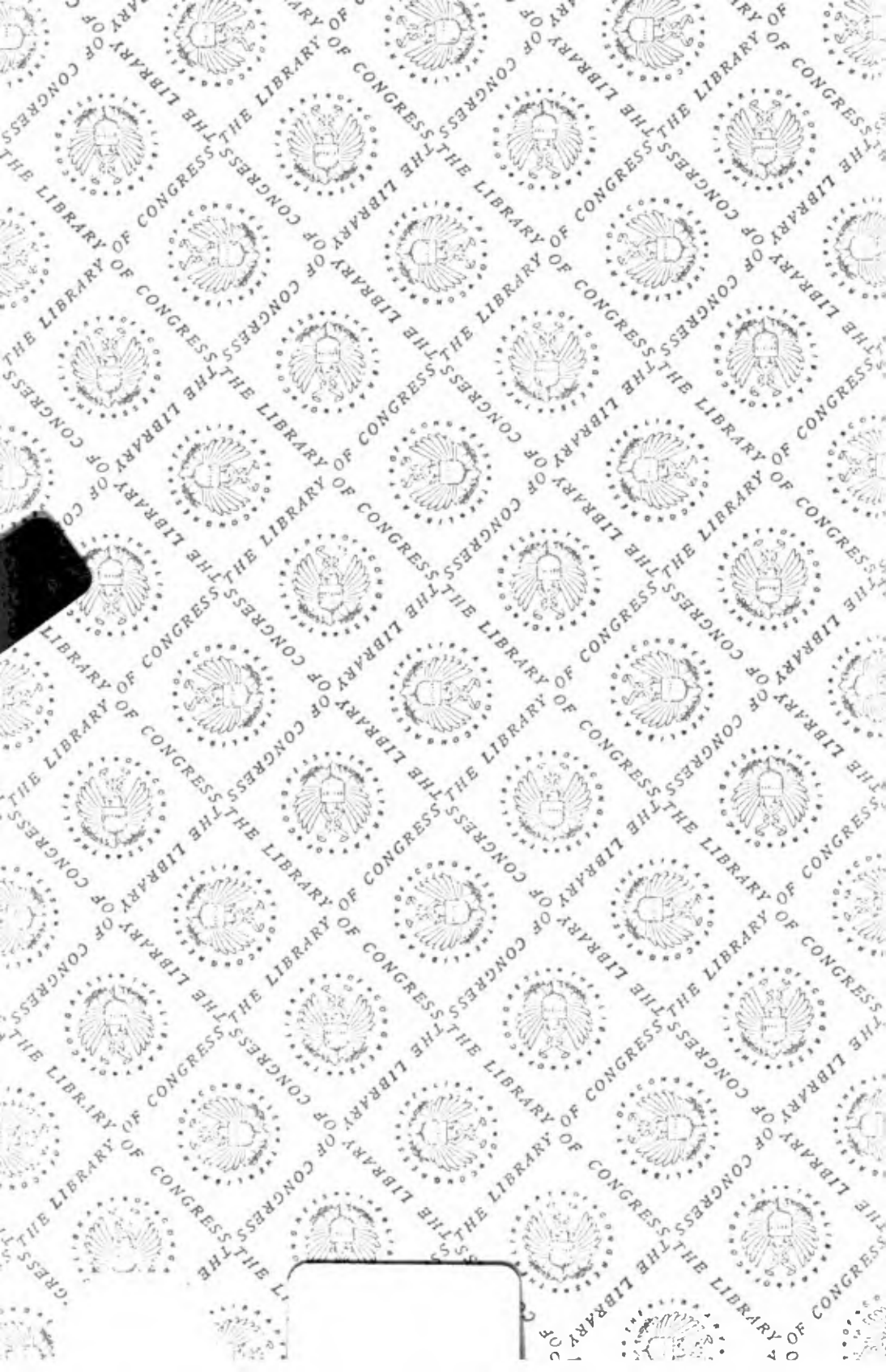
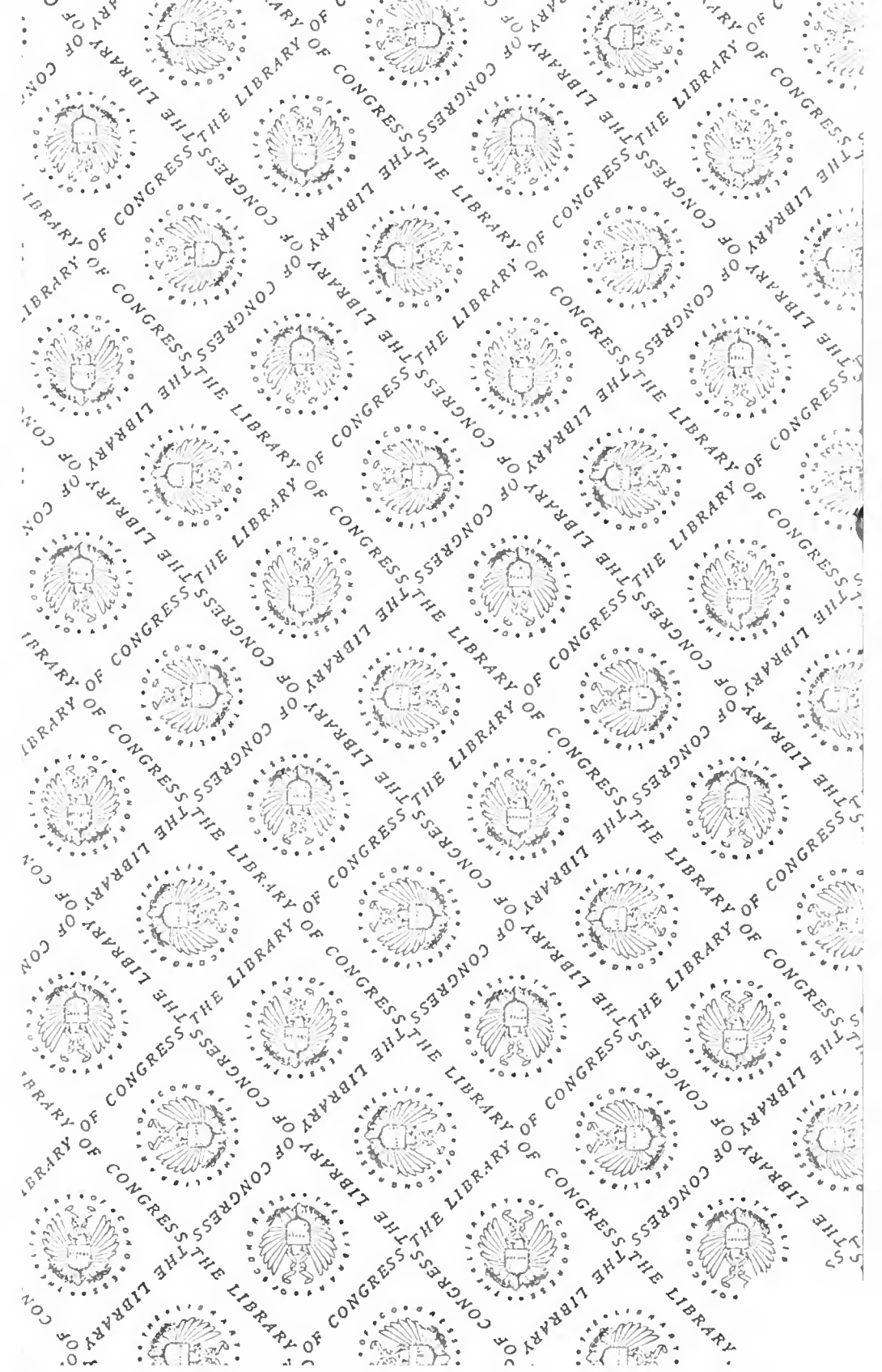


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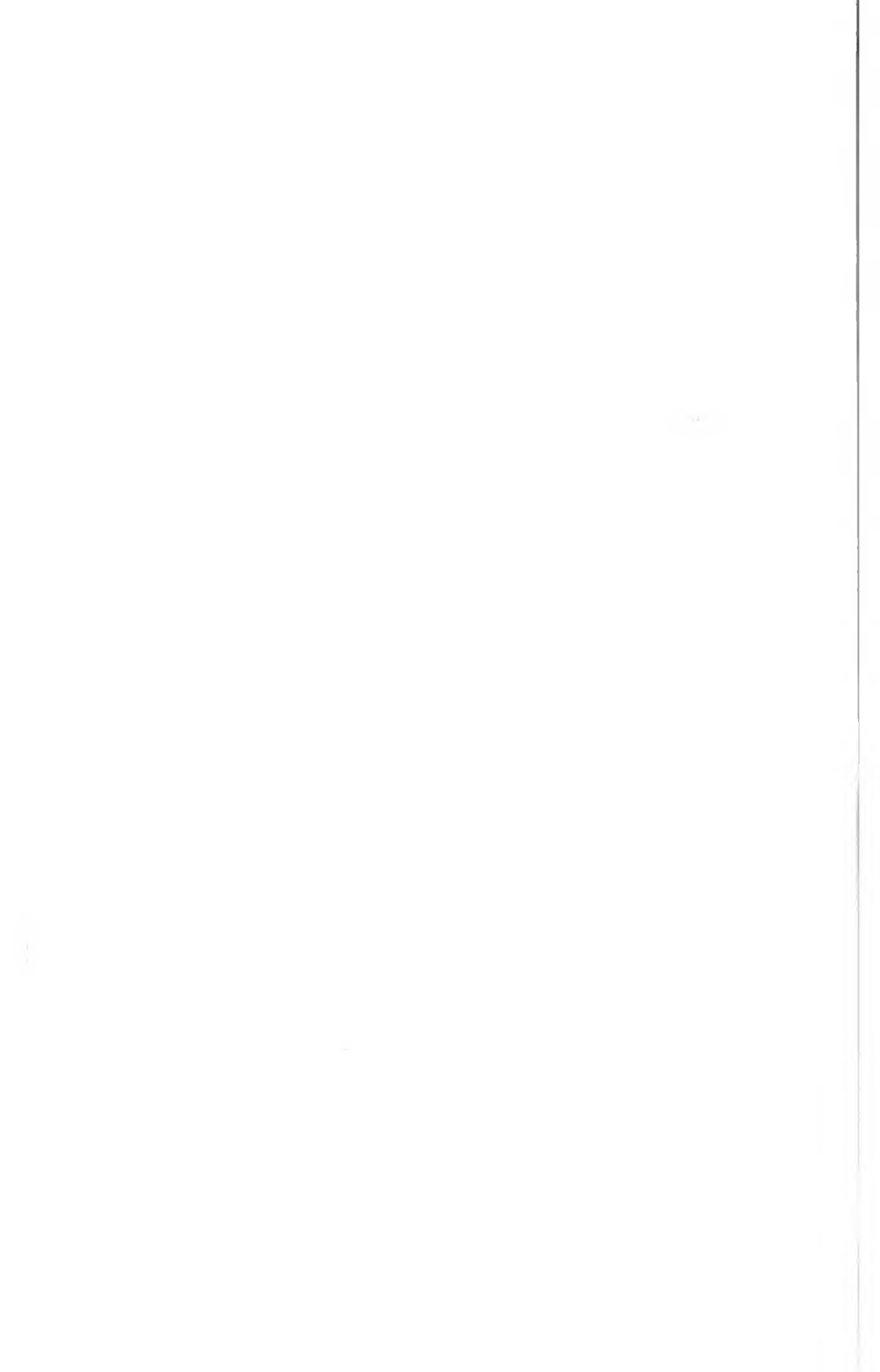
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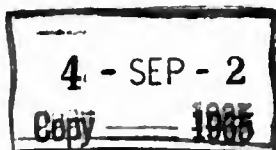








COMMERCE DEPARTMENT TRANSPORTATION RESEARCH



U.S. Congress. House. Committee on Interstate and Foreign Commerce. Subcommittee on Transportation and Aeronautics,

CARD DIVISION

Addendum to hearings held May 19, 25 and June 29, 30, 1965, on H.R. 5863, a bill to authorize the Secretary of Commerce to undertake research and development in high-speed ground transportation, and for other purposes (and identical bills).

65- 62384

(NOTE.—The following statements were inadvertently omitted when the above hearings were printed.)

STATEMENT OF HUGHES AIRCRAFT CO.

An enormous number of design decisions must be deduced to establish the configuration of a high-speed, public transportation system of the future for safe, reliable, and efficient operation. The analysis which produces these decisions must show that the system configuration achieved is the best available in terms of the demand structure and our technical knowledge, and appropriate criteria of economy, user convenience, safety, and financial and political reality. It should be recognized by the Congress and administration that a program of advanced research to illuminate the social, economic, and technical issues, must be a major and early step in the program to provide high-speed, public transportation between cities.

Hughes Aircraft Co. endorses such a research program and is convinced that the Nation's vast reservoir of systems analysis skill, developed through many years of work on the complex systems problems of NASA and the Department of Defense, is readily applicable to it. The following paragraphs present comments on several of the pertinent issues:

I. THE NEED FOR RESEARCH IN HIGH-SPEED GROUND TRANSPORTATION

A. The technology of public ground transportation has stagnated in this country for five decades or more. We have remained wedded to the crushed-rock roadbed, the wooden tie, closely spaced steel rails and wheels, the separately coupled car, the separate traction unit (in general), the downtown union station and yards (in general), and the like. Tracks have been smoothed and sometimes welded, the traction has been improved in cleanliness and economy, the cars on some lines have been brightened and air conditioned, but for the most part we are providing only a better version of the old service, and the better version is not good enough to command a sufficient public patronage to pay for itself or to facilitate our achieving our full potential in economic growth.

The Japanese (Tokaido) high-speed train is judged to represent nearly the ultimate of convenience and performance attainable by the evolutionary "product improvement" route, but its performance, at speeds under 150 miles per hour, and its economics, render that approach possibly inadequate for the future transportation needs of the northeast corridor. Only competent analytical comparison of it with alternatives to fill the demand can decide. A new basis of development is required; this new basis can be found by a recourse to modern technology and the synthesis of new modes for the fast movement of people and bulk masses.

B. Adequate transportation is one of the key requirements for economic growth; when transportation approaches saturation, or the transportation efficiency is poor, growth ceases. As an example, it has been informally estimated at Hughes that the demand for public transportation in the northeast corridor would almost triple by 1980, in comparison with the present demand, if the convenience to each traveler could be kept at the present (rather poor) levels. However, we believe that no economically feasible enlargement of superhighway, airway, and airport facilities along current patterns could "hold the line" on convenience and hence that this potential demand (representing net growth) will be incompletely realized unless new departures

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in transportation modes, or new patterns of employment, are devised. By any accounting, growth which might have been achieved but is not achieved is an irretrievable economic loss.

In this regard, we take note that since 1945 some \$3 billion of investment, in the northeast corridor area, in superhighways, airlines, and airports, has failed to keep pace with rising transportation congestion.

C. Consider briefly the direct economic payoff of research which optimizes the efficiency of systems. It is very conservative to assert that an optimum ground transportation system would be more than 1 percent cheaper to build than a new system designed without research-based optimization, and that its annual operating cost would be improved by at least 1 percent. It has been publicly estimated that the capital investment in the northeast corridor program might ultimately be in the neighborhood of \$2 billion; in that event the 1-percent capital saving by user demand and technical research is immediately worth \$20 million.

Furthermore, if annual operating cost before revenue offset is \$100 million, the 1-percent operating saving would amount to a further \$1 million a year or a further \$20 million in 20 years, not counting interest. Thus one can assert on these crudely constructed but conservative arguments that research which improves the northeast corridor system by only 1 percent is worth some \$40 million in the long run—and we expect that the research will do very much better than provide a 1-percent improvement.

Transportation by all modes is a major element of the gross national product—roughly 20 percent of it. Steps toward more nearly optimum design and utilization of this resource, taken on the basis of appropriate research, will measurably increase the productivity of the Nation as a whole.

D. The technical position of the United States in public ground transportation lags behind that of Japan, Germany, Sweden, and France, at least. An effective American research and development program would provide the basis for an export trade in ground transportation equipment which in recent decades has largely been lost to foreign sources. There is little doubt that there are enormous future sales of efficient transportation systems to be made in Africa, Latin America, Asia, and even Europe; these sales will flow to the supply source which best fills the need. It is not the argument here that the specific systems found to be preferred in any particular American application are those which will be needed in the seventies and eighties in the markets mentioned, but it is maintained that the research which underlies the U.S. program will point the way to reacquisition of leadership in the export trade with new designs. The implications of this leadership for the U.S. balance of payments and U.S. prestige need not be elaborated.

11. TECHNOLOGICAL TRANSFER FROM AEROSPACE SKILLS TO GROUND TRANSPORTATION

The aerospace industries are skilled in systems analysis and synthesis. These words mean that we have developed the capability to analyze and solve exceedingly complex technical problems through many years of effort on the requirements of the Department of Defense

and NASA. These skills are applicable to many issues found in the problem of high-speed ground public transportation. A few examples of problems amenable to systems analysis may be useful at this point:

A. For selection among the prime modes of operation of vehicles on any link, it will be necessary to work out in rather generous detail the routings, propulsion, economics, and performance of alternative modes, to represent these characteristics in mathematical language, and to perform extensive tradeoff and comparison studies by electronic computers. This problem is of the same order of complexity as the design of the U.S. supersonic transport. By reviewing the SST program, the public has become familiar with the great difficulty which attends finding the preferred configuration of a complicated technical system in which large number of variables are interrelated.

B. When, in time, the preferred transportation mode and vehicle configurations have been discovered, a host of subsidiary technical problems will come forward. A noteworthy one is the safety, control, and communication system which the high-speed carriers will require. It has come to be recognized that safe operation and control of the new vehicles will create demands that surpass human operator skill. Recourse to computer-controlled operation is essential. Such a system would achieve balanced service frequency, load distribution, and least operating cost; it would manage both normal service demands and the irregular transients of heavy demand; it would program the station slowdowns for the off-coupling of terminating traffic and the on-coupling of other cars bearing originating traffic; it would smooth and stabilize the ride of the carriers, cope with mechanical malfunctions or obstructions on the right-of-way; it would eliminate the possibility of collisions of any kind.

The configuration of a proper computer-oriented safety, control, and communication system for the several routes and their vehicles is squarely within the skills and resources of the aerospace-electronics industry. The needed people, organizations, techniques, and facilities for the work are in place and ready.

III. FEDERAL SUPPORT OF RESEARCH AND DEVELOPMENT IN HIGH-SPEED GROUND PUBLIC TRANSPORTATION

A. There is little possibility that the existing transportation firms, or any combination of them, could marshal the funds needed to implement the needed advanced ground transportation systems in the United States, even if the demand pattern were fully understood (which it is, as yet, not). This remark largely depends upon the continuingly precarious financial position of most of the railroads. Existing rights-of-way may have to be wholly reworked where used, and new ways will have to be constructed along revised route portions (above or below ground). New vehicles and terminals are required, along with advanced right-of-way and on-board control, safety, and communication equipment. Capital outlays of many hundreds of millions of dollars are in prospect, and the only visible source for finance of ground systems at these levels is the Federal Government.

B. Inasmuch as the established carriers cannot manage the capital outlays for system implementation, they have no a priori guarantee that a system will in fact be implemented, and hence they have little basis for absorbing the risk of supporting the transportation research which will specify the systems which ultimately should be achieved.

Hence we are led again to a need for Federal participation, in this instance in the support of demand studies and transportation research and development. This latter argument also explains, incidentally, why the potential suppliers of advanced equipment to the advanced systems are unable to go beyond exploratory study of the problem within their own resources.

C. Intercity transportation systems cross over a very large number of local and State jurisdictional boundaries. Problems of land acquisition, zone adjustment, and attendant litigations, suggest that the program should possess the concerned supervision of the Federal Government. The sustained operation of the system in the interest of the people calls for a continuing degree of public participation in supervision of the system's operation.

CITIZENS TRANSIT IMPROVEMENT ASSOCIATION,
Washington, D.C., July 1, 1965.

Subject: H.R. 5863 and the plight of the Nation's railroads.

Hon. OREN HARRIS,
Chairman, Committee on Interstate and Foreign Commerce,
U.S. House of Representatives, Washington, D.C.

DEAR CONGRESSMAN HARRIS: The Citizens Transit Improvement Association wishes to go on record as supporting H.R. 5863 with the amendments that we recommend in this statement. We request that this statement be made a part of the printed record of the public hearings on H.R. 5863.

It is our position that, if H.R. 5863 is not amended to focus attention on the need to preserve, expand, and improve railroad transportation in the United States, H.R. 5863 inadvertently could do more harm than good to the defense transportation posture, and to the economic and social welfare, of our country. H.R. 5863 authorizes the Secretary of Commerce to "undertake research and development in high-speed ground transportation." However, the Commerce Department's Bureau of Public Roads has the dominant voice in shaping the transportation policies of that Department. Already the Bureau of Public Roads has greatly undermined railroad transportation in the United States, contributing materially to the upward trend of transportation costs experienced by the Nation's shippers. Consequently, in view of the dominant role of the Bureau of Public Roads, with its dreams of electronic highways as the solution to ground transportation problems, we urge that the Department of Commerce not be the instrumentality for undertaking research and development in high-speed ground transportation for our increasingly urbanized country.

In asking that specific attention be focused on the Nation's railroads, we call to your attention the following facts:

1. During World War II, 97 percent of the organized troop movements by common carrier, in continental United States, were by railroad.

2. During World War II, 90 percent of the military freight traffic by common carrier, in continental United States, moved by rail.

(We urge you to verify the above statistics by contacting the Defense Traffic Management Service. We obtained them

from "the Gathering Transportation Storm," a booklet published by the Association of American Railroads in 1961 or 1962.)

3. At the time of the 1962 Cuban missile crisis, the Federal Government caused executives of railroad companies to be routed out of bed in the middle of the night, so that the railroads could be mobilized for the movement of troops and equipment. We know of no such disturbance to the slumber of executives of bus companies and trucking companies at that time.

4. With the growing threat of further escalation of the hostilities in Vietnam, the logistical significance of railroad facilities and services assumes increased importance.

5. As a result of prolonged periods of drought or less than normal rainfalls, the water level of lakes and rivers has fallen in certain regions of the United States, thus imposing problems on waterborne shipping. On at least some of the Great Lakes, for example, ore boats are not being fully loaded in order to avoid scraping the bottom of the lakes. Consequently, we suggest that your committee communicate with the American Iron & Steel Institute, to ascertain the extent to which this condition requires the domestic steel industry to utilize railroads to a greater extent than it would in the absence of falling water levels; also, whether truck transportation, to any appreciable extent, has helped alleviate the problem posed by the need to load ore boats at less than capacity.

6. Transportation utilizing cars rolling on steel flanged wheels supported by steel rails provides much greater dependability during periods of severe weather than any other form of transportation. For example, about 7 or 8 years ago, a few thousand racing fans were stranded at Bowie, Md., because of a sudden snowstorm. Highway vehicles were useless. Helicopters, which had brought some VIP's to the racetrack, were unable to take them home. Who came to the rescue? It was the Pennsylvania Railroad, which dispatched two special trains to Bowie. (It seems quite appropriate that passengers, who use the railroads only when weather prevents the use of other modes of transportation, are called snowbirds.)

7. As your committee knows, railroad companies provide their own rights-of-way at their own expense, and they pay taxes—often discriminatory—on these rights-of-way, the tracks on them, and on abutting properties owned by these companies. Real estate taxes have contributed materially to the reduction of railroad mileage in the United States, and this mileage reduction will increase the cost of the future expansion of our railroads, and of the development of rail rapid transit in urban and metropolitan regions.

8. Other forms of transportation use publicly owned highways that are not subjected to real estate taxes, airways that are made safe and are monitored by the Federal Government, and waterways that benefit from the work of the U.S. Army Corps of Engineers, the U.S. Navy, and the Coast Guard.

9. Although there is no Federal bureau, board, or commission whose sole responsibility is the development and improvement of railroad transportation, there are Federal agencies that energetically and very effectively develop and promote highway, air, and water-

borne transportation—at costs that are not borne in full by the companies that benefit from the programs of those Federal agencies.¹

10. Largely because of favoritism, by various levels of government, on behalf of competing forms of transportation, transportation of passengers and mail by rail has been declining in absolute terms, and transportation of freight by rail has been constituting a declining share of the total transportation of freight, in spite of the impressive economic growth of the United States, and in spite of the fact that the railroad industry now has considerably more technical know-how than it had when the railroads predominated in the transportation of persons and goods.

(An example of the decline of railroad passenger transportation: Although the Pittsburgh and Cleveland metropolitan areas are gradually merging into one interstate megalopolis, it is no longer possible for a passenger to board a train in Pittsburgh and alight from the same train in Cleveland, or vice versa.)

(An example of what could be accomplished here: In Japan, a much-publicized superrailroad, the new Tokaido line between Tokyo and Osaka, went into passenger and freight service in October 1964. It does not replace the older railroad; it supplements it. Trains reach a speed of 125 miles an hour, and after the tracks have settled, the top speed will be increased to 150 miles per hour. The world speed record for trains was set during a test run in France 10 years ago—207 miles per hour. This train used an electric locomotive and standard tracks.)

With this background information, we make the following recommendations with respect to H.R. 5863:

1. Page 1, lines 4 and 5, substitute for "high-speed ground transportation," the following: "high-speed rail transportation using two parallel running rails of the kind used in railroad transportation." (We also recommend the addition of a separate sentence giving a statutory definition of railroad transportation.)

2. Delete section 2, because it is unnecessary. Every competent organization collects statistics and other information in engineering and economic feasibility studies. (Focusing attention on the subject matter of sec. 2 could encourage some future Secretary to substitute "further studies" for prompt action.)

3. Page 2, line 11, add "qualified" to "personnel". Define "qualified" within the context of railroad development and improvement.

4. Page 2, line 14, define "procure services".

5. Replace the language of section 4 completely. Substitute a new section 4, enumerating the Federal agencies—and the kinds or levels of government, particularly, State and county governments—to be consulted. (As long-distance transportation improvement apparently is to be dovetailed to some extent with metropolitan rapid transit development, it is important that the more comprehensive cooperation, that we recommend, be embodied in the legislation

¹ Although the Department of Commerce has a high-speed ground-transportation project, the northeast corridor transportation project, it encompasses other forms of transportation besides railroad transportation, and there is no assurance that Commerce will not become preoccupied with forms of transportation whose engineering and economic feasibility has not been tested—including electronically guided buses and trucks operating at high speeds. Whether railroad managements would be willing to invest company funds in vast improvements and experiments, in the face of increased Government pampering of other forms of transportation, is highly questionable.

here considered. Whatever agency has responsibility for the development of long-distance ground transportation facilities should be required to consult the relevant State and county governments, and transit districts or authorities.)

6. Establish a National Railway Research and Development Institute (or National Railway Technological Institute) as an independent Federal agency headed by an Administrator. (Railroad progress will not occur on the scale necessary unless it is unhindered by the power and influence of the Bureau of Public Roads.)

7. Substitute the word "Administrator" for the words "Secretary" and "Secretary of Commerce."

In our view, it is imperative that the Congress furnish guidelines and instructions for the conduct of the research and development activities authorized by H.R. 5863. On too many occasions, we have seen the apparent intent of Congress, in the field of transportation, implemented in a distorted or confused manner by administrators and planners having a highway orientation. This is particularly true with respect to the manner in which the Federal-Aid Highway Act of 1962 is being applied to metropolitan regions by the Bureau of Public Roads.

We are also disturbed by the fact that the "Buck Rogers." futuristic, exotic approach to transportation research is receiving major attention in connection with the northeast corridor transportation project. This approach might bear fruit in the 21st century, but we have serious transportation problems right now. We can save decades of time, billions of dollars, and enhance our defense transportation posture if we give top priority to both short- and long-range improvement and development of our railroads. Consequently, we urge that H.R. 5863 be made more detailed and specific, and that the amendments we propose be adopted.

Sincerely yours,

HILLIARD H. GOODMAN,
Executive Vice President.

STATEMENT OF DR. PAUL J. CLAFFEY, TRANSPORTATION ENGINEER

Large-scale research into several aspects of the ground transportation of passengers is vitally needed in this country and, where elements of this research are costly, lacking in a prospect of early financial benefit to the investigator, and/or where the basic value of the results are to the consumer or to the general public, it becomes important for the Federal Government to provide the necessary support. This is contemplated in this legislation.

I wish to testify concerning the importance of one aspect of ground transportation research which has not been investigated in depth heretofore but which could be investigated by the Department of Commerce if this bill is enacted. This is the evaluation of user criteria for transportation service. It may be described as the determination of reasonably accurate information for transportation planning purposes of the value to users of (a) time saving in travel, (b) riding comfort, (c) transportation convenience, (d) safety in travel, and (e) reduced fares. Each of these items is of concern to travelers in some measure, is reflected in the use or nonuse of specific transportation

facilities, and is related to the demand of citizens for modern transportation facilities. Rational planning of improved ground transportation systems cannot be made without greatly improved knowledge in this area. The present situation whereby the planning of transportation means to provide for these user needs is almost entirely dependent on planners' subjective judgments must give way to planning based on factual information.

The problem is complicated by difficulties both in measuring the items of user travel need and in placing a value on individual items. For example, how can user comfort be measured, what are the factors of user travel comfort? Is it the availability of a seat, the size of the seat space provided, environmental conditions, or the smoothness of ride? Is there a common comfort factor? How much is each of these or of a unit of common comfort factor worth? What is the value of passenger time saving in travel? The answers to these questions can only be obtained by a massive research project such as would be possible by the Department of Commerce through passage of this bill. The information does not exist now.

If the planning of future ground transportation facilities is to be in accordance with the needs of the country for improved travel means and if the large sums that will be committed by various agencies on new transportation means are to be well spent, research information on user transportation criteria is urgently needed. I urge that H.R. 5863 be enacted into law.

STATEMENT OF H. GUYFORD STEVER, PRESIDENT OF THE CARNEGIE INSTITUTE OF TECHNOLOGY, AND CHARLES LAW MCCABE, VICE PRESIDENT FOR RESEARCH OF THE CARNEGIE INSTITUTE OF TECHNOLOGY

Coming from Pittsburgh, which is widely recognized as having made rather remarkable progress in clearing its atmosphere and in rebuilding large sections of the central city but which only now is coming to grips with the total regional transportation problem, we applaud the broad approach to the intercity transportation problem in densely populated areas of the country contained in H.R. 5863 and feel that its passage is a logical step for the Federal Government to take at this time. We feel this is so because it is highly desirable to have research and development, in the transportation field, take place as fast as our progress in technology and the state of the economy can possibly allow.

Our remarks are divided into two parts. The first is the need for the Federal Government to undertake the program of action outlined in the bill under discussion here; the second part contains some comments about some of the sections of the bill which related to technical matters.

We note first that, in the United States and in the world, we are now experiencing such rapid technological development in most fields that it does not take a great amount of imagination to envision many potentially feasible technical solutions to the problem of transporting people at high speeds in densely populated areas. However, to attain high speed and, at the same time, low cost with a high degree of safety and reliability means necessarily the development of a highly complex

system having many parts which have been "tailor made" for the system itself, parts which must be designed to work together in order to achieve the desired goal. Therefore, if our objective is to take at this time the biggest possible step, the R. & D. effort needed to determine first what the general characteristics of the system should be and later the detailed design of the system is of such magnitude that no private company, or group of companies, has yet volunteered to assume the financial risk. It is unlikely that this situation will change. Also, no governmental unit other than the Federal Government itself, can assume the risk since the total problem is national in scope. Therefore, if progress is to be made, the Federal Government is the logical unit to assume a leadership and coordinating role. We feel it highly significant that the bill under discussion fully makes provision for taking maximum advantage of technological advances in many fields.

There are two general aspects of the high-speed ground transportation problem which we should particularly like to discuss. The first involves the use of one of our basic natural resources—land. Obviously, for the future the optimal use of land is an increasingly critical factor for us in the United States—critical because of our projected population growth and because of the trend for our citizens to prefer to live in densely populated area. The bill under discussion deals with proper land use in two ways. First, its aim is to create an efficient system resulting in limited land use for the system itself. And, second, the mere provision of an excellent high-speed ground transportation system makes it possible to have corridors of higher population density—areas in which our citizens apparently like to live. It seems to me that these, and perhaps other land use considerations, are important factors to consider in relation to this bill.

The second point is related to another fundamental problem area of our time—namely, devising methods whereby the private and public sectors of our Nation can join forces to accomplish worthwhile goals. Obviously, this has been done with great success in the areas of space exploration and military technology. It seems to us that in the high-speed ground transportation field we have yet another area in which the ordinary operation of the private marketplace cannot evolve the best systems which modern science and technology could devise and support in a sufficiently short time. As noted above, the problem is complex and, therefore, at best very time consuming. It seems to us that, if left to the private sector alone, the attack would continue to take place by one small step at a time, or not at all, and would result in the final solution being postponed for such a long time that society would have had to adjust to the problem in a manner which would for most people minimize free choice rather than maximize it. It is our position that a systematic approach such as that outlined in H.R. 5863 is a good approach, one which is consistent with our maintaining a healthy private sector, while at the same time providing for a mechanism for governmental action which is proper and is urgently needed.

The second part of our remarks deals with some of the specific sections in the legislation.

First, the research and development program: We believe that the proposed research and development program has in it all of the elements necessary to attain the objectives of the proposed legislation for the following reasons:

(a) The approach is a broad one embracing many technical fields—engineering, science, information processing, sociology, psychology, etc., insuring that all pertinent technology and information about the uses of the transportation system is used in order to arrive at the best possible solution to the total problem.

(b) The approach is an “integrated systems” approach making sure that the final product does not look and behave as though it has been designed by a committee on the one hand or a “warmed over” version of an existing system on the other.

(c) In mapping out the program, full cognizance has been taken of the many new technologies that have been developed for other systems—space systems, military systems, or communications systems. Obviously, the probability is high that a great many concepts and ideas, as well as specific items of hardware, can provide problem solutions unavailable even to the engineers who designed the “light-weight passenger trains” in the 1950’s.

(d) The guidelines for the research are broad enough so that our Nation’s capacity for real innovation in this field can indeed be harnessed, increasing considerable the chance for a really big step to be taken by the United States in this important technical area.

Second, the demonstration projects: The demonstration projects seem to us to be a particularly valuable part of the program since they have important consequences for the short run as well as for the long run. For the short run, these demonstration projects may provide the key to improved service or services which are economically viable. For the long run, they will provide a basis for testing the response of the public to improved service and thereby make it possible to take advantage of the newer hardware research and development work, referred to previously, in the design of the new system, without having to test customer reaction at every turn. Since it is expensive in time and money to build a complete new system to test each innovation in the marketplace, it is essential to have some way to test the marketplace, and the demonstration projects outlined here would do just that.

In short, we believe this bill to be an excellent step for our country to take at this time because the need is great, only the Federal Government can adequately do the job, and the program put forward in this bill is imaginative yet sound.





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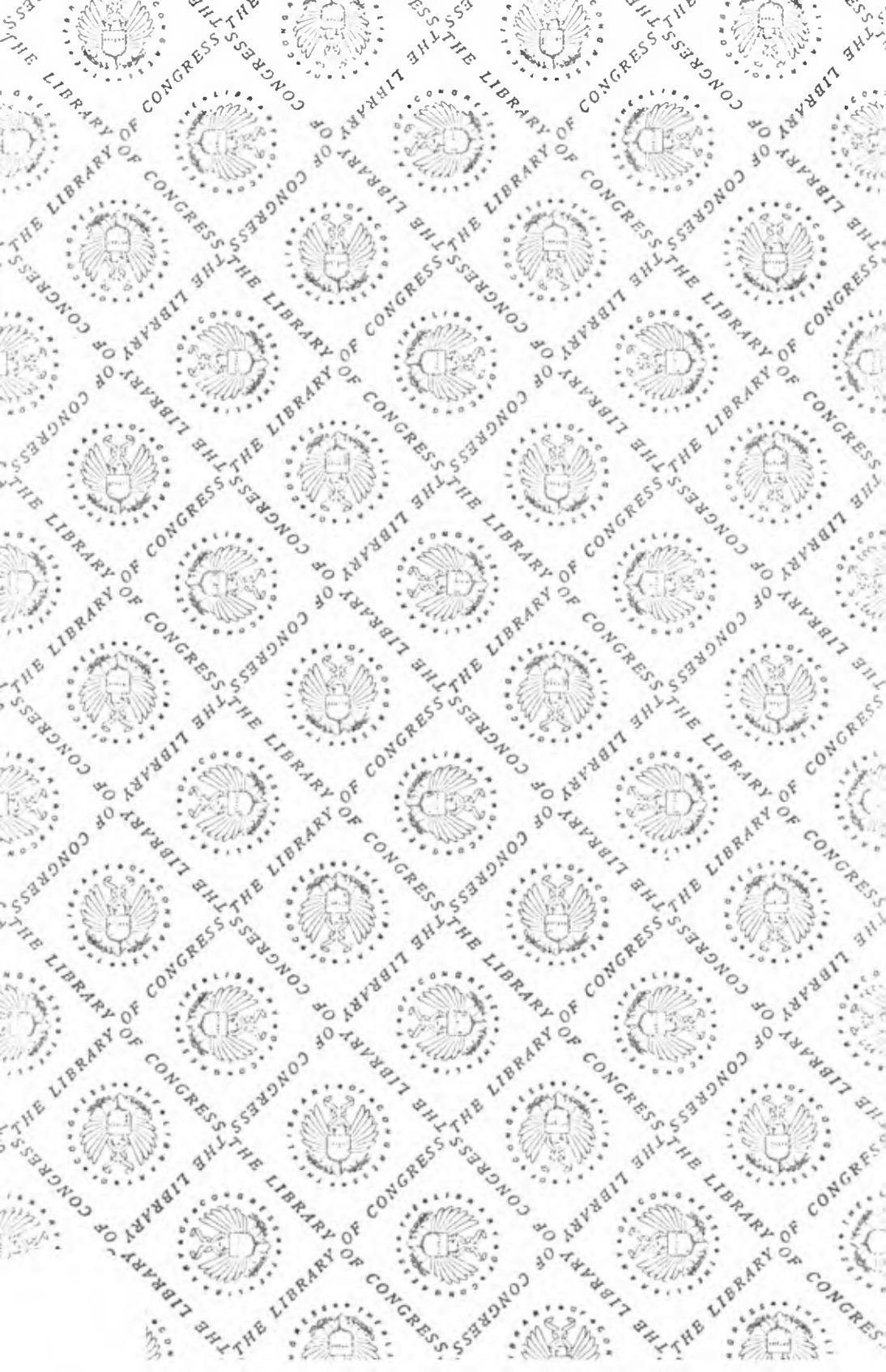
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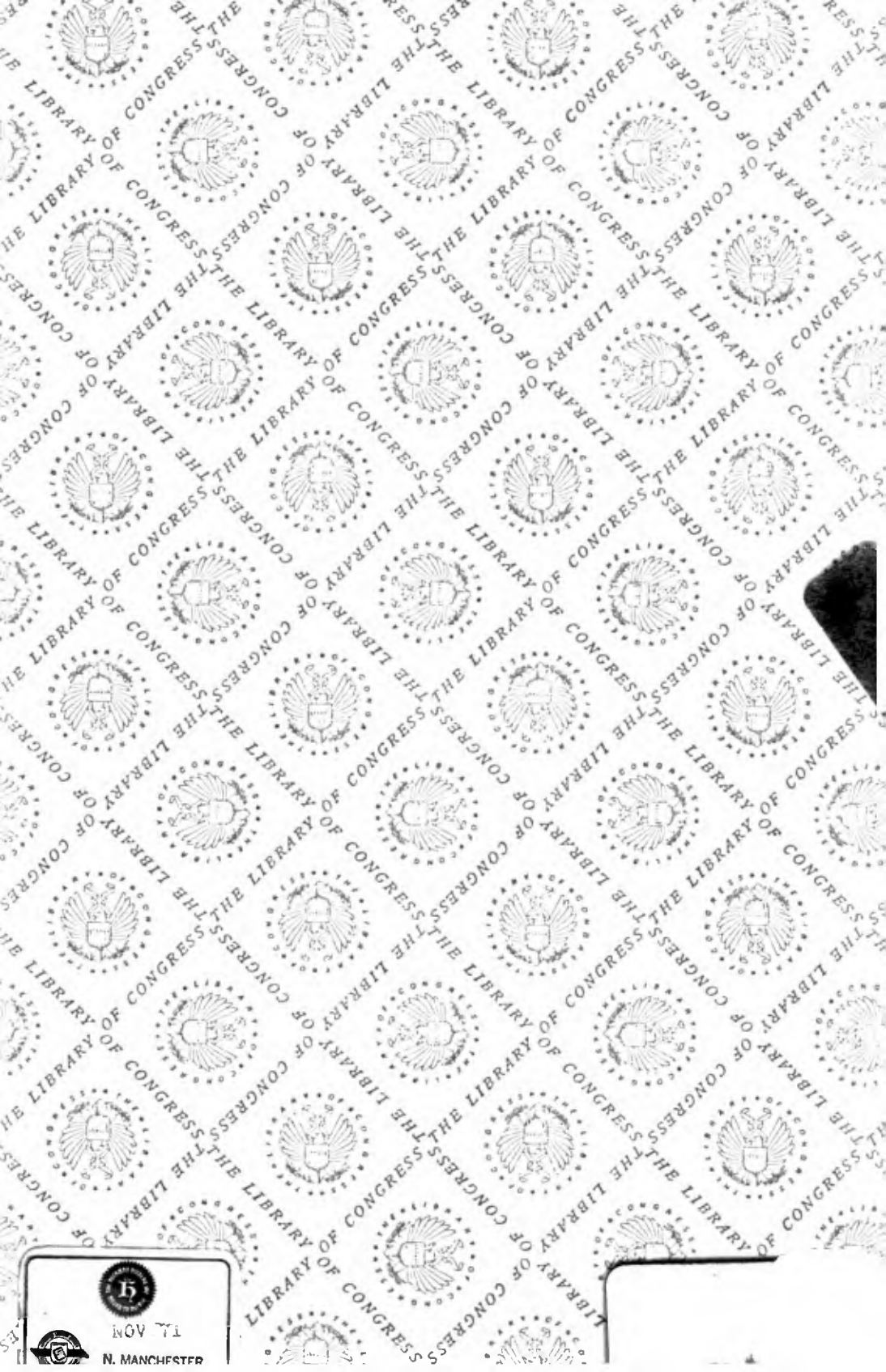
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